

Particulate Air Pollution and Hospital Admissions for Congestive Heart Failure in Seven United States Cities

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Background: The association between short-term elevations in ambient particulate air pollution and increased cardiovascular morbidity and mortality is well documented. Ambient particles may also trigger acute decompensation in patients with congestive heart failure (CHF), but this hypothesis has not been evaluated in a systematic manner. This study evaluated the association between daily levels of respirable particulate matter (PM) of aerodynamic diameters $<10\text{ }\mu\text{m}$ (PM_{10}) and the rate of hospitalization from the emergency room for CHF in Medicare recipients (age >65 years) in seven United States cities from 1986 and 1999.

Methods: The time-stratified, case-crossover design was used to separately estimate the effect of a $10\text{-}\mu\text{g}/\text{m}^3$ increase in PM_{10} in each city. A combined random-effects estimate was then obtained from the city-specific effect estimates.

Results: There were 292,918 admissions with primary diagnoses of CHF during the observation period. Overall, a $10\text{-}\mu\text{g}/\text{m}^3$ increase in PM_{10} was associated with a 0.72% (95% confidence interval: 0.35% to 1.10%) increase in the rate of admission for CHF on the same day. The effect of PM_{10} appeared to be less in patients with secondary diagnoses of hypertension. There was no consistent effect modification by age, gender, race, or any other secondary diagnosis evaluated.

Discussion: In conclusion, these results support the hypothesis that elevated levels of particulate air pollution, below the current limits set by the United States Environmental Protection Agency, are associated with an increase in the rate of hospital admission for exacerbation of CHF. We have developed an animal model in which to explore the pathologic mechanisms' particulate sources responsible for these effects.

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